

CLAIMS

What is claimed is:

1. A method of providing a wireless communication network with downlink propagation channel information, the method comprising:

5 receiving a first signal at a wireless device transmitted from a network transmitter through a downlink propagation channel;
determining a channel estimate for the downlink propagation channel at said wireless device based on receiving said first signal;
transmitting said channel estimate from said wireless device to a network
10 receiver within the wireless communication network.

2. The method of claim 1 wherein receiving a first signal at a wireless device transmitted from a network transmitter through a downlink propagation channel comprises receiving at least one transmit signal containing information known to the
15 wireless device.

3. The method of claim 2 wherein determining a channel estimate for the downlink propagation channel at the wireless device based on receiving the first signal comprises:
correlating the information known to the wireless device with the first signal; and
20 estimating channel characteristics of the downlink propagation channel based on the results of said correlation.

4. The method of claim 3 wherein transmitting the channel estimate from the wireless device to a network receiver within the wireless communication network
25 comprises transmitting said channel characteristics back to said wireless communication network.

5. A method of generating a channel estimate for a downlink propagation channel in a wireless communication network, the method comprising:

transmitting a first signal from said network to a wireless device through the downlink propagation channel;

5 receiving a second signal at said network from the wireless device comprising channel estimate information derived from the first signal for the downlink propagation channel; and
setting a channel estimate in said network for the downlink propagation channel based on the channel estimate information.

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6. The method of claim 5 further comprising updating said channel estimate in said network based on subsequent channel estimate information received from the wireless device.

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7. The method of claim 5 further comprising:
receiving channel estimate information from a plurality of wireless devices; and
setting a plurality of channel estimates in said network for downlink propagation channels corresponding to the plurality of wireless devices based on said channel estimate information.

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8. A method of generating a channel estimate for a downlink propagation channel in a wireless communication network, the method comprising:

receiving a first signal at a wireless device transmitted from a network transmitter through one or more downlink propagation channels;

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generating a loop-back signal at the wireless device comprising at least a portion of the first signal; and

transmitting the loop-back signal from the wireless device to a network receiver associated with the wireless communication network, wherein the first signal is known by the network, such that the loop-back signal may be used by the network to estimate the downlink propagation channel.

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9. The method of claim 8 wherein generating a loop-back signal at the wireless device comprising at least a portion of the first signal comprises adding at least a portion of the first signal together with uplink information known to the network.

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10. The method of claim 9 wherein adding at least a portion of the first signal together with uplink information known to the network comprises adding uplink pilot information to the loop-back signal, such that the network can estimate uplink propagation channel characteristics using said uplink pilot information.

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11. The method of claim 8 wherein generating a loop-back signal at the wireless device comprising at least a portion of the first signal comprises:
looping back at least a portion of the first signal; and
interrupting loop-back of the first signal periodically to transmit uplink information known to the network.

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12. The method of claim 8 generating a loop-back signal at the wireless device comprising at least a portion of the first signal comprises adding mobile-specific information to the portion of the first signal looped back to form said loop-back signal.

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13. A method of generating a channel estimate for a downlink propagation channel in a wireless communication network, the method comprising:

transmitting a first signal to a wireless device through the downlink

propagation channel;

receiving a loop-back signal from the wireless device at a network receiver

associated with the wireless communication network, said loop-back

5 signal comprising at least a portion of the first signal; and

generating a channel estimate for the downlink propagation channel based on

said loop-back signal from the wireless device.

14. The method of claim 13 wherein generating a channel estimate for the downlink
10 propagation channel based on the loop-back signal from the wireless device comprises
correlating said loop-back signal with signal information used to generate said first
signal.

15. The method of claim 13 further comprising removing uplink propagation channel
15 effects from said loop-back signal.

16. The method of claim 15 further comprising generating said channel estimate for
the downlink propagation channel after removing said uplink propagation channel effects
from said loop-back signal.

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17. The method of claim 15 wherein removing uplink propagation channel effects
from said loop-back signal comprises:

correlating said loop-back signal with known uplink information;

determining said uplink propagation channel effects based on said

25 correlation; and

canceling said uplink propagation channel effects from said loop-back signal.

18. The method of claim 13 further comprising:

transmitting a plurality of first signals to a plurality of wireless devices;

receiving a plurality of loop-back signals from the plurality of wireless

5 devices; and

generating a plurality of channel estimates for downlink propagation channels

associated with the plurality of wireless devices based on said plurality of

loop-back signals.

10 19. The method of claim 18 further comprising removing uplink propagation channel effects from each one of said plurality of loop-back signals.

20. The method of claim 19 further comprising generating said plurality of channel estimates after removing said uplink propagation channel effects from said plurality of
15 loop-back signals.

21. The method of claim 19 wherein each one of said loop-back signals includes mobile-specific uplink information known to said network, and wherein removing uplink propagation channel effects from each one of said plurality of loop-back signals

20 comprises correlating each one of said plurality of loop-back signals with the corresponding mobile-specific uplink information.

22. A method of providing a wireless communication network with downlink
propagation channel information, the method comprising:

receiving first signals transmitted by the network as a composite received signal,
said first signals combining at said wireless device to provide wanted
5 information to the wireless device while canceling unwanted information
intended for other wireless devices;

determining an amount of interference at said wireless device associated with the
unwanted information arising from imperfect cancellation of the unwanted
information; and

10 transmitting interference information back to the wireless communication
network, wherein said interference information indicates network-based
downlink channel estimation error to the network.

23. The method of claim 22 wherein determining an amount of interference at said
15 wireless device associated with the unwanted information arising from imperfect
cancellation of the unwanted information comprises correlating said composite received
signal with known information embedded in said composite received signal.

24. The method of claim 23 wherein said known information comprises mobile-
20 specific known information for each one of a plurality of wireless devices, including said
wireless device and said other wireless devices, and wherein correlating said composite
received signal with known information embedded in said composite received signal
comprises correlating said composite received signal with said mobile-specific known
information to determine an amount of interference caused by said unwanted information
25 signals for said other wireless devices.

25. The method of claim 22 wherein transmitting interference information back to the wireless communication network comprises transmitting an interference measurement of un-cancelled interference caused by the unwanted signals back to the network.

5 26. The method of claim 25 wherein transmitting an interference measurement of un-cancelled interference caused by the unwanted signals back to the network comprises transmitting interference measurements for each one of a plurality of unwanted signals corresponding to a plurality of other said wireless devices.

10 27. The method of claim 22 further comprising:
receiving a plurality of composite received signals at a plurality of wireless
devices, wherein said composite received signal at each said wireless
device comprises a wanted information signal for said wireless device
and interfering unwanted information signals corresponding to other ones
15 of said plurality of wireless devices;
determining an amount of interference from said interfering unwanted information
signals at each one of said plurality of wireless devices; and
transmitting interference information bearing on said amount of interference from
each one of said plurality of wireless devices back to the network.

28. A method of generating channel estimates for downlink propagation channels in a wireless communication network, the method comprising:

transmitting first signals from network transmitters to a plurality of wireless devices, such that said first signals combine at each said wireless device to cancel unwanted information signals for other ones of said plurality of wireless devices;

receiving unwanted signal interference measurements from said plurality of wireless devices; and

updating said channel estimates of downlink propagation channels used by said network in generating said first signals based on said unwanted signal interference measurements, such that unwanted signal interference is reduced at said plurality of wireless devices.

29. The method of claim 28 wherein updating said channel estimates of downlink propagation channels used by said network in generating said first signals based on said unwanted signal interference measurements comprises:

determining an amount by which each of said channel estimates is in error based on said unwanted signal interference measurements; and

adjusting said channel estimates based on said errors so as to reduce said unwanted signal interference at said wireless devices.

30. The method of claim 28 wherein transmitting first signals from network transmitters to a plurality of wireless devices comprises:

generating an information signal for each one of said wireless devices;

combining said information signals using said channel estimates to generate said first signals as weighted combinations of said information signals; and

transmitting said first signals from a plurality of network transmitters, such that
each said wireless device receives a composite received signal as a
combination of said first signals.

5 31. The method of claim 30 wherein the extent to which said unwanted signals
cancel at each one of said wireless devices depends on how well said channel estimates
match actual downlink propagation channel estimates between said network transmitters
and said wireless devices, and wherein updating said channel estimates of downlink
propagation channels used by said network in generating said first signals based on said
10 unwanted signal interference measurements comprises adjusting said channel estimates
such that said unwanted signal interference is reduced at said wireless devices.

32. A mobile terminal comprising:
a receiver to generate a received information signal based on receiving a radio
15 signal from a remote transmitter in a wireless network;
a transmitter to generate a transmit signal for transmission to a remote receiver
in said wireless network based on processing a transmit
information signal;
a combiner to form said transmit information signal based at least in part on said
20 received information signal, such that said transmit signal from said
mobile terminal functions as a loop-back signal for said wireless network.

33. The mobile terminal of claim 32 further comprising a processor to generate a pilot
information signal, and wherein said combiner generates said transmit information signal
25 at least in part based on combining said received information signal with said pilot

information signal, such that said loop-back signal to said wireless network carries pilot information from said mobile terminal.

34. The mobile terminal of claim 33 wherein said combiner generally operates to form said transmit information signal based on said received information signal, but periodically operates to form said transmit information signal based on said pilot information signal, such that said loop-back signal to said wireless network comprises looped-back transmit information from said wireless network, interspersed with pilot information from said mobile terminal.

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35. The mobile terminal of claim 33 wherein said processor generates said pilot information, such that said pilot information signal distinguishes said mobile terminal with said wireless network, thereby allowing said wireless network to determine said mobile terminal as the source of said loop-back signal.